Service: Collecting and recording disaster damages and loss data according to European Directives and Guidance for responding to the Sendai Framework requests.

Mandated by: The Disaster Risk Management Knowledge Centre at JRC-European Commission

Requesting Authority: Regional Civil Protection Directorate of Catalonia (Spain)

Deliverable 4.1: Pilot test on the case study of the 2013 Val d’Aran Flood
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Type of deliverable: Technical report
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1. Damage Data Loss Data pilot architecture

This report presents the implementation phase of the pilot application for Disaster Damages and Loss Data management Application (DDLD application). In the following we present the internal architecture of the pilot system (see Figure 1) and the technological platform supporting the DDLD application pilot (see Figure 2). We opted for the use of open-source software supporting both application development and database management systems (including GIS extenders).

![Figure 1. DDLD application internal architecture](image)

The technological platform supporting the DDLD application pilot is composed by the following open platforms:

- Linguaggio di programmazione backend: JAVA
- Sistema di controllo di versione: GIT ([https://git-scm.com](https://git-scm.com))
- Repository sorgenti Bitbucket ([https://eclipse.org](https://eclipse.org))
2. DDLD application Interface design

DDLD Use case diagrams

For the design of the IT system interfaces according to the requirements described in Del 3.1, we used UML use-case diagrams modelling.

Use-case diagrams permit to model who are the ‘actors’ outside a system (i.e., the interface users) and their interactions with that system. Indeed, Use Cases help visualize the system to be implemented and specify the behavior of the system in terms of functionalities supported by it. The use-case diagrams presented below describe the categories of users that would access to the IT interfaces, which could insert data and which may access in reporting mode. Moreover, the diagrams list the purposes for which the system is used through the description of the functions it offers and their sub-functions (i.e., include and extend relationships).
Figure 2. Residential damage data management use case diagram
Residential damage compensation data management

Figure 3. Residential damage compensation data management use case diagram

Reporting and visualizing damage data/compensation data

Figure 4. Reporting and visualizing damage data/compensation use case diagram
3. DDLD application pilot implementation

DDLD web application interfaces

a. Login

A user profile contains user permissions and access settings that control what users can do within their organization (see Figure 6).
It is through the procedure of login that the application permits to select the functionalities that the user can visualize and then utilize. Indeed, we defined two categories of users:

1. Citizens, which are not “technically” prepared users
2. Volunteers and Public administration that are considered as “prepared” surveyors

The users must submit their data by registering for the first time in order to be able to log in (Figure 7 and Figure 8).

Figure 7. Interface of the Login of the Damage Data Management Application
The application pilot was developed particularly for the use of public administration agent belonging to the Catalunya Civil Protection. However, the system is enabled for other categories of users as previously presented.

After the login, the public administration agent would visualize the main menu (Figure 9), where he or she can access three different functionalities: “Residential building damages data management”, “Survey physical damages to network components” and “Survey outage of telecommunication service”. The public administration agent at this point can click on the desired button and access each functionality. These functionalities are explained in the next paragraphs.
b. Residential Damage Data Management Application

In the following, we are going to consider and follow the path that a surveyor of residential building physical damages will find once he logs in in the application. This part of the application permits the surveyor to insert the data related to the damages that affected residential buildings. These buildings may contain one or more housing units (e.g. a condominium with apartments). Furthermore, the damage is surveyed by housing unit and by floor.

![Interface of the damage data collection application for residential buildings.](image)

The interface in Figure 10 allows the surveyor to visualize on the left the status of the building surveys, organized in “surveys in progress”, “completed surveys” and “approved surveys”. On the one hand, if a building survey were still in progress (appearing in the “in progress” list) it would be possible to update the damage data and eventually to add new apartments (housing units) and floors that are assessed in a second time, until the surveyor closes the survey. On the other hand, a building survey if completed (and closed) would appear in this interface in the “completed surveys” list and it would possible to the refunding body to approve and/or modify the estimated costs inserted in this survey.

The procedure of damage data collection, assumes that the surveyor would be present in the building accompanied by the owner or the tenant of the single housing units (or the whole building). Some of the data that would be collected would be provided by the house owner and others surveyed directly by the surveyor.

As presented in the architecture of the Information System, we propose to connect logically but also visually for the surveyor the historical dimension of the damage data regarding the past events (when existing) and the current one. The surveyor would visualize the present event, once inserted its data, among the list of pre-existing ones.

Indeed, the interface in Figure 11 and Figure 12 permits the surveyor to characterize the event that hit the building he is surveying. The event is characterized by its temporal and spatial dimensions, as perceived from the damaged building. We should remember that this application considers FLOODS as the event category.
Figure 11. Interface for the insertion of data regarding the flood event (duration and intensity).

Once the event data are inserted, the surveyor, assuming he needs to insert a new building survey, would be able to identify the building in different ways (Figure 13):

- Using the map interface where he can click on the single building if present in the map. In this way, the address and the GPS coordinates associated to this point on the map are automatically filled in by the application (the missing data may be filled and modified by the surveyor). This adds a level of control on the collected data.
• Otherwise, if the building is not present in the map (here we use an open source mapping system – BING) it would be possible for the surveyor to identify the building inserting directly the address, the GPS coordinates and other data on the building.

**Figure 13. Building identification interface.**

After having inserted the data on the damaged building, the surveyor must insert the data regarding the damaged housing unit inside that building. These data include information on the owner(s), the residents of the housing units and the indication of the floors or “levels” that were flooded (Figure 14 and Figure 15). This process, and what will be explained next, would be repeated per housing unit.

**Figure 14. Interface for housing unit data insertion.**
Through the design of this interface, the surveyor has visually the awareness of the connection between the event and the damaged asset that is the building, its housing unit, then its damaged floors and finally the detailed assets present in each floor of the house. In Figure 16 it is possible to see the interface regarding the description of each floor (e.g. area, conservation state, use, etc.).

Moreover, by following this process of surveying he would be able to insert the single damages through the description (Figure 17, Figure 18):
1. Firstly of the **physical damage**: such as square meters of damaged wall cladding, number and square meters of damaged doors, number and square meters of damaged windows, square meters of damaged flooring, furniture, appliance, etc.

2. Secondly, the description of the **related estimated cost of repair or replacement** to each physical damage.

Of course, if data is not available it will not be compulsory to insert it, and this does not mean that the values are ZERO, but that they are not available in the system. The non-availability of a specific data is a fact we wanted to record by using these YES / NOT checkboxes.

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**Figure 17.** Interface for physical damage description (to doors, windows and structural damage) and estimated costs.

**Figure 18.** Interface for physical damage description (furniture, appliance, others) and estimated costs.
The surveyor would also insert data regarding the mitigation actions taken by the residents (Figure 19).

![Figure 19. Mitigation actions data insertion per floor (level) of housing unit.](image)

Finally, the surveyor would add notes, if necessary, regarding the whole survey of the housing unit (Figure 20).

![Figure 20. Interface for insertion of notes regarding the survey of the housing unit](image)
c. Telecom Networks Damage Data Management Application

We will follow here the path of a member of the public administration, particularly from the Civil Protection, that wishes to insert in the IT system physical damages and/or outages to telecommunications networks during an emergency.

Survey physical damage to network component

Analogously to the Residential damage data insertion, the first step is to define the event to which the damages are related. In this case, the event is defined from the Civil Protection’s point of view (the “Emergency Hazard Event”). The user is asked to select an existing event from a list (Figure 23) or to insert a new one if necessary (Figure 21 and Figure 22).

![Figure 21. Insertion of a new emergency hazard event.](image)

DAMAGE DATA MANAGEMENT APPLICATION

Emergency hazard events
Classification *

Start time *

End time

Nuts1

Nuts2

Nuts3

Competent Authority

Unit Of Management

Outages
Category

Month

Year

Debris flow, mud flow, rock fall

07-Mar-2017 00:00:00

07-Mar-2017 00:00:00

No data

Gale

Galicia

Ourense

Protección Civil de Catalunya

No data

Select
Afterwards, it will be possible to insert a new damaged network component or to select an existing one from a list that shows all the components already present in the database (Figure 24). In case a new damaged component needs to be inserted, it is required to the user to define the category (punctual/linear), a type, indicate if it is buried and an optional description.
The application offers different ways for defining the location of the damaged component on a map:

- By clicking on the “D” (Design) button, it is possible to draw on the map:
  - Point: when the damaged component is a punctual object.
  - Line: for linear components.
  - Polygon: for defining a subnetwork or an area when the exact location is unknown.
- By clicking on the “G” (GPS) button, useful in case the data insertion is done near the damaged component.

The physical damage would then be inserted with a description, an optional level of damage, date and damage assessment method, an optional picture (Figure 25). Last, the Civil Protection agent would indicate, if known and relevant, the affected service provider(s) starting from the primary one. These can be selected from an existing list of service providers or added if new (Figure 26).

Figure 24. Description and location of a new damaged component.
Analogously to the Residential damage data insertion and to the survey of physical damage to network components, the first step is to define the event to which the damages are related. In this case, the event is defined from the Civil Protection’s point of view (the “Emergency Hazard Event”). The user is asked to select an existing event from a list or to insert a new one if necessary.

Afterwards, it will be possible to insert an outage by defining the outage category, the start and end time and date, a percentage of loss of service if applicable. The outage location is defined by designing a
polygon in the map, which represents the area affected by the loss of service (where the affected users are located) or with the use of a point (in case of a particularly relevant affected user, e.g. critical facility such as a hospital). The user would click on the “D” (design) button and draw (Figure 27).

![Figure 27. Outage description and location in map, showing both possibilities: a polygon and a point.](image)

Regarding the affected users, the public agent may insert the total number of affected users in the area defined in the map and/or to specify the number of affected users by class (residential, commercial, industrial, agriculture, public building and critical facility) (Figure 28). The description box allows as well adding the name or type of a particular critical facility that is affected (e.g. school, hospital, port, etc.).
Figure 28. Affected users description: insertion of number of affected user by class (Residential, Commercial and Industrial).

Last, the Civil Protection agent would indicate the affected service provider(s) starting from the primary one. These can be selected from an existing list of service providers or added if new.